Eureka Lake

Site Description

Location

Water designation number (WDN)	47-0001-00
Legal description	T127N-R73W-Sec. 34,35
County (ies)	McPherson
Location from nearest town	northwest edge of Eureka, SD

Survey Dates and Sampling Information

Survey dates	September 16, 2014 (GN)
Gill net sets (n)	3

Morphometry (Figure 1)

Watershed area (acres)	35,880
Surface area (acres)	225
Maximum depth (ft)	15
Mean depth (ft)	7

Ownership and Public Access

Eureka Lake is owned by the city of Eureka and the fishery is managed by the SDGFP. Eureka Lake has exceptional public access as a gravel road skirts much of the west shore of the western basin. Two public boat ramps, fishing pier, and a city park are located on the lake.

Watershed and Land Use

Land use within the 35,880 acre Eureka Lake sub-watershed (HUC-12) is primarily agricultural including a mix of pasture or grassland, cropland, and scattered shelterbelts. The community of Eureka is located within the watershed.

Water Level Observations

No water level observations were made in 2014.

Fish Management Information

Primary species	walleye, yellow perch
Other species	black bullhead, bluegill, common carp, northern pike, orangespotted sunfish, smallmouth bass
Lake-Specific regulations	none
Management classification	warm-water semi-permanent
Fish consumption advisories	none

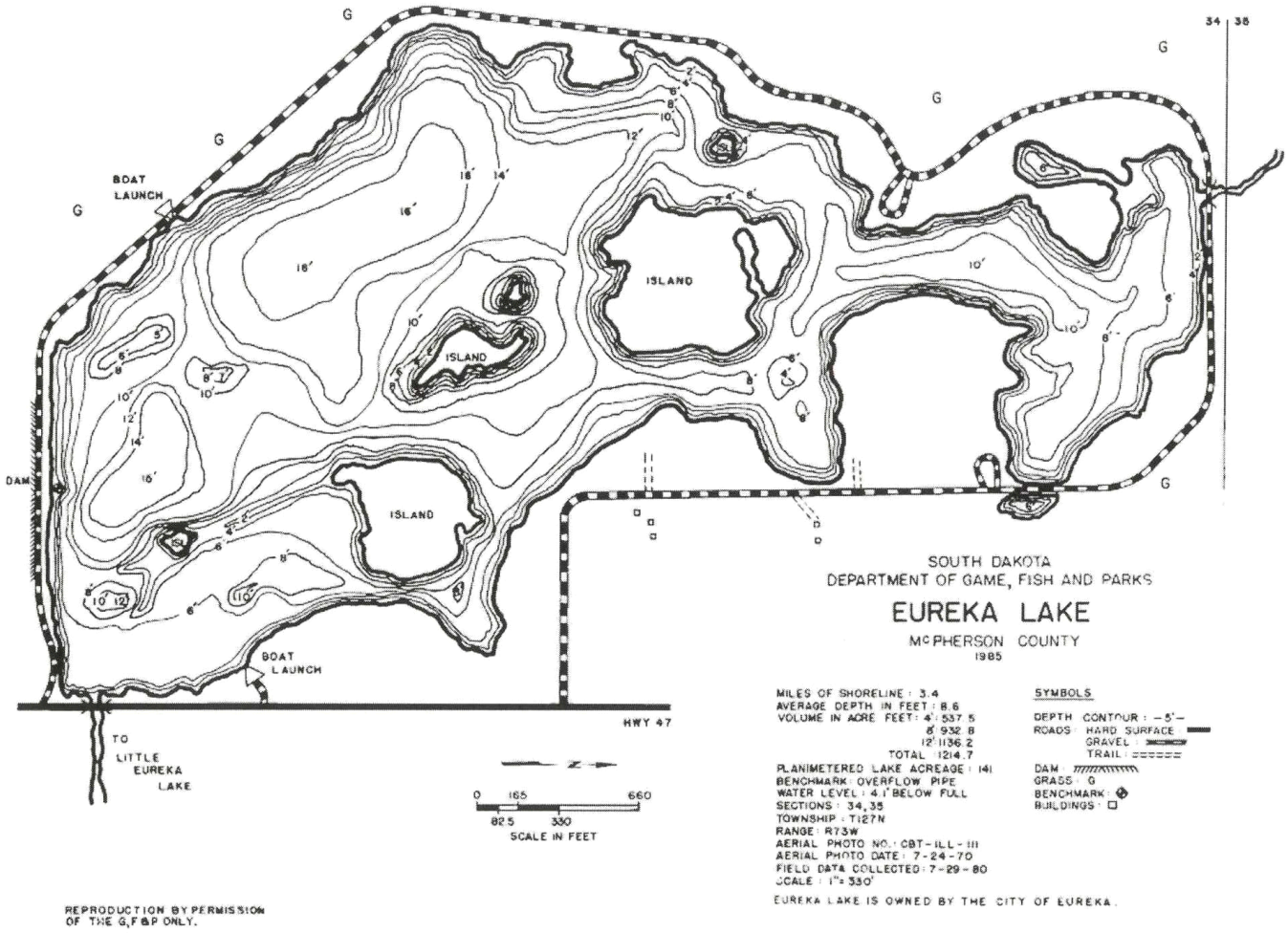


Figure 1. Depth contour map of Eureka Lake, McPherson County, South Dakota.

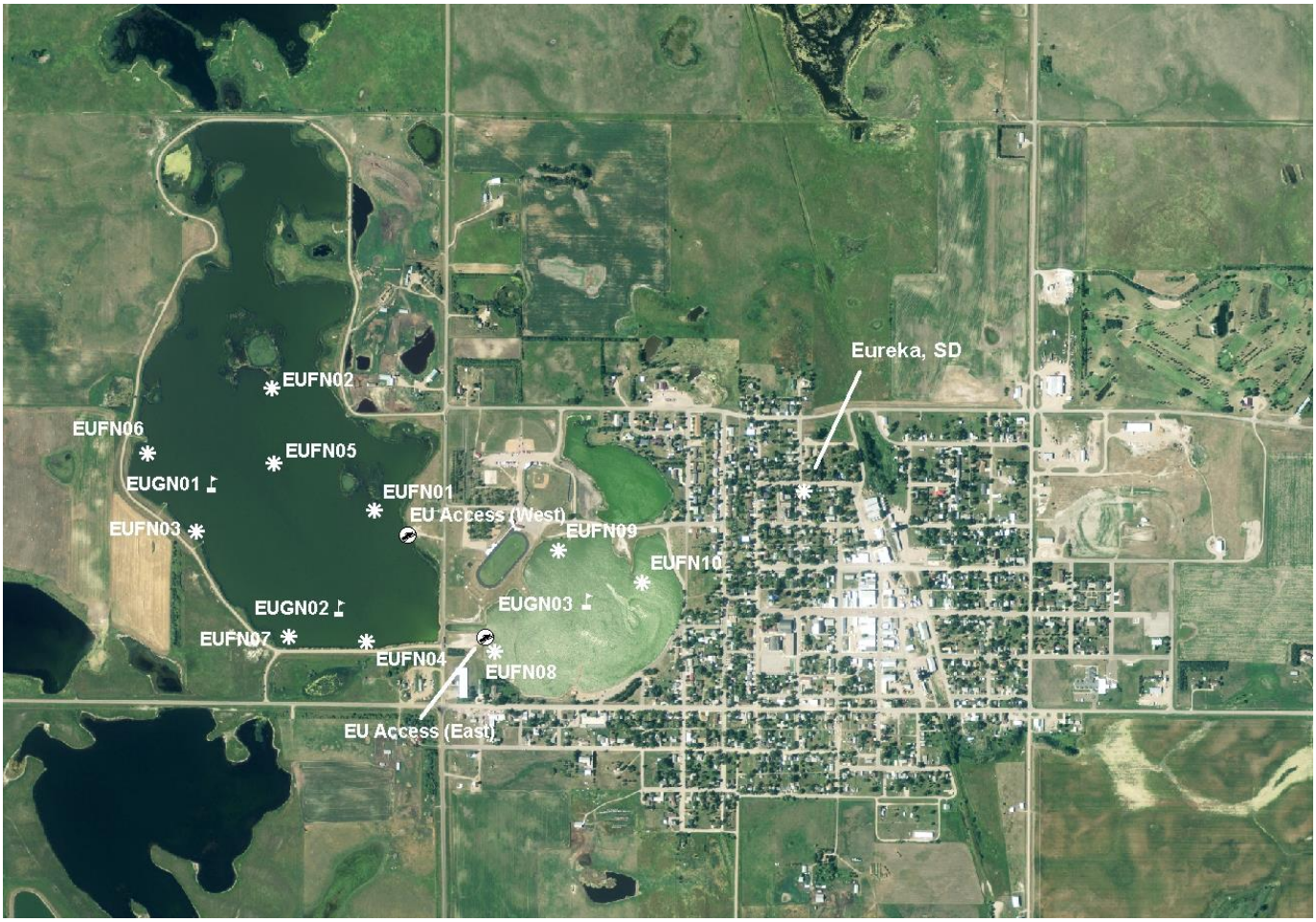


Figure 2. Map depicting geographic location of Eureka Lake (McPherson County), South Dakota. Also noted are public access and standardized net locations for Eureka Lake. EUFN= frame net; EUGN= gill net

Management Objectives

1) Maintain a mean gill net CPUE of stock-length walleye ≥ 10, a PSD of 30-60, and a PSD-P of 5-10.

2) Maintain a mean gill net CPUE of stock-length yellow perch ≥ 30, a PSD of 30-60, and a PSD-P of 5-10.

3) Maintain a mean frame net CPUE of stock-length black bullhead ≤ 100.

Results and Discussion

Primary Species

Walleye: The mean gill net CPUE of stock-length walleye was 14.7 (Table 1) and above the minimum objective (≥ 10 stock-length walleye/net night; Table 3). The 2014 mean gill net CPUE represented a substantial increase from the 2010 CPUE of 5.0, but comparisons are difficult as the timing of the survey has varied (Table 2). Based on the 2014 gill net CPUE, relative abundance is considered high.

Walleye captured by gill nets in 2014 ranged in TL from 17 to 51 cm (6.7 to 20.1 in; Figure 3). Age estimates from otoliths revealed the presence of six year classes (2007, 2009-2012 and 2014; Table 4). The naturally-produced 2014 (age-0) year class was the most abundant and comprised 51% of walleye in the gill net catch; the 2011 cohort, which coincided with a fry stocking, accounted for an additional 38% (Table 4; Table 6). The contribution of stocked or naturally-produced walleye to year classes produced during stocked years is unknown, as stocked walleye were unmarked making it difficult to differentiate stocked from naturally-produced walleye.

In 2014, the weighted mean TL at capture for age-3 walleye was 454 mm (17.9 in; Table 5). The majority of stock-length walleye in the gill net catch were in the quality-preferred length category, which had a mean Wr of 93.

Yellow Perch: The mean gill net CPUE of stock-length yellow perch was 15.3 (Table 1) and below the minimum objective (≥ 30 stock-length perch/net night). The 2014 gill net CPUE represented a decrease from the 2010 CPUE of 24.0, but still suggested moderate relative abundance.

Yellow perch captured in the 2014 gill net catch ranged in TL from 10 to 31 cm (3.9 to 12.2 in; Figure 4). The PSD was 91 and the PSD-P was 85; both exceeded management objectives of 30-60 and 5-10, respectively, indicating a population skewed towards larger (>25 cm; 10 in) yellow perch (Table 1; Table 3; Figure 4).

Otoliths were collected from a sub-sample of yellow perch in the 2014 gill net catch; eight consecutive year classes were present (2007-2014). Most cohorts were represented a by a relatively-low number of individuals (Table 7). The 2011 year class was the most abundant and comprised 50% of the entire sample (Table 7).

In 2014, the weighted mean TL at capture of age-3 yellow perch was 282 mm (11.1 in; Table 8). As with most populations, males tend to be smaller at a given age

than females, particularly at older ages (Table 8). Mean Wr values ranged from 85 to 91 for all length categories (e.g., stock to quality) represented in the gill net catch. The mean Wr of stock-length yellow perch was 90 (Table 1) and no length-related trends in condition were apparent.

Other Species

Northern Pike: Northern pike typically are not sampled effectively during mid-summer fish community surveys. As a result, mean gill net CPUE values are often low. In 2014, gills net captured five northern pike that ranged in TL from 46 to 65 cm (18.1 to 25.6 in). The mean gill net CPUE of stock-length northern pike was 1.7 (Table 1). Gill net captured individuals had Wr values that ranged from 81 to 105, which is typical of northern pike collected in summer surveys from northeast South Dakota waters.

Other: Common carp and orangespotted sunfish were other fish species captured in low numbers during the 2014 survey (Table 1).

Management Recommendations

1) Conduct fish population assessment surveys on every fourth year basis (next survey scheduled in summer 2018) to monitor fish relative abundance, fish population size structures, fish growth, and stocking success.

2) Collect otoliths from walleye and yellow perch to assess age structure and growth rates of each population.

3) Stock walleye (≈500 fry/acre) biennially to establish additional year classes.

4) Monitor winter and summer kill events. In cases of substantial winter/summer kill stock northern pike, walleye and yellow perch to re-establish the fishery.

Table 1. Mean catch rate (CPUE; catch/net night) of stock-length fish, proportional size distribution of quality- (PSD) and preferred-length fish (PSD-P), and mean relative weight (Wr) of stock-length fish for various fish species captured in experimental gill nets from Eureka Lake, 2014. Confidence intervals include 80 percent (± CI-80) or 90 percent (± CI-90). COC= common carp; HYB= hybrid sunfish; NOP=northern pike; OSF= orangespotted sunfish; WAE= walleye; YEP= yellow perch

	Abundance		Stock Density Indices				Condition	
Species	CPUE	CI-80	PSD	CI-90	PSD-P	CI-90	Wr	CI-90
Gill Nets								
COC	2.3	3.5	57	39	14	28	83	5
HYB[1]	0.3	0.6	---	---	---	---	---	---
NOP	1.7	1.7	80	43	0	---	92	9
OSF[1]	4.0	3.3	---	---	---	---	---	---
WAE	14.7	4.9	100	0	2	4	93	1
YEP	15.3	8.2	91	7	85	9	90	1

[1] All fish sizes

Table 2. Historic mean catch rate (CPUE; catch/net night) of stock-length fish for various fish species captured in frame nets and experimental gill nets from Eureka Lake, 2002-2014. BLB= black bullhead; BLG= bluegill; COC= common carp; HYB= hybrid sunfish; NOP=northern pike; OSF= orangespotted sunfish; SMB= smallmouth bass; WAE= walleye; YEP= yellow perch

	CPUE			
Species	2002[1]	2006[1,2]	2010[1]	2014[1]
Frame nets				
BLB	21.9	0.2	0.1	---
BLG	0.4	10.9	2.0	---
COC	0.3	0.2	0.1	---
NOP	0.2	0.2	0.2	---
OSF[3]	0.0	0.3	0.1	---
SMB	0.0	0.0	0.1	---
WAE	0.5	2.3	0.2	---
YEP	1.5	1.9	13.2	---
Gill Nets				
BLB	15.3	0.7	0.0	0.0
BLG	0.0	1.7	0.3	0.0
COC	0.7	5.7	4.3	2.3
HYB[3]	0.0	0.0	0.0	0.3
NOP	2.7	1.3	1.3	1.7
OSF[3]	0.0	0.3	0.0	4.0
WAE	20.3	13.7	5.0	14.7
YEP	1.0	26.0	24.0	15.3

[1] Surveyed on June 4-5 (2002), September 19-20 (2006), August 17-18 (2010), and September 16 (2014)
[2] Monofilament gill net mesh size (0.75”, 1.00”, 1.25”, 1.50”, 2.00” and 2.50”)
[3] All fish sizes

Table 3. Mean catch rate (CPUE; catch/net night) of stock-length fish, proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish, and mean relative weight (Wr) for selected species captured in frame nets and experimental gill nets from Eureka Lake, 2002-2014. BLB= black bullhead; WAE = walleye; YEP = yellow perch

Species	2002[1]	2006[1,2]	2010[1]	2014[1]	Objective
Frame nets					
BLB					
CPUE	22	<1	<1	---	≤ 100
PSD	92	0	0	---	---
PSD-P	0	0	0	---	---
Wr	92	85	90	---	---
Gill nets					
WAE					
CPUE	20	14	5	15	≥ 10
PSD	49	71	60	100	30-60
PSD-P	2	15	13	2	5-10
Wr	92	94	86	93	---
YEP					
CPUE	1	26	24	15	≥ 30
PSD	67	29	44	91	30-60
PSD-P	0	13	1	85	5-10
Wr	84	96	94	90	---

[1] Surveyed on June 4-5 (2002), September 19-20 (2006), August 17-18 (2010), and September 16 (2014)
[2] Monofilament gill net mesh size (0.75", 1.00", 1.25", 1.50", 2.00" and 2.50")

Table 4. Year class distribution based on the expanded age/length summary for walleye sampled in gill nets and associated stocking history (# stocked x 1,000) from Eureka Lake, 2010 and 2014.

	Year Class													
Survey Year	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001
2014[1]	45		3	33	4	2		1						
2010[1]	---	---	---	---	2	11	3	6		1				2
# stocked														
fry		100		100										
sm. fingerling						18		20						
lg. fingerling										9				

[1] Surveyed on August 17-18 (2010) and September 16 (2014)

Table 5. Weighted mean TL at capture (mm) for walleye captured in experimental gill nets (expanded sample size) from Eureka Lake, 2006-2010. Note: sampling was conducted on September 19-20, 2006; August 17-18, 2010; and September 16, 2014.

	Age									
Year	0	1	2	3	4	5	6	7	8	9
2014	200(45)	---	405(3)	454(33)	459(4)	502(2)	---	484(1)	---	---
2010	152(2)	227(11)	302(3)	403(6)	---	442(1)	---	---	---	524(2)
2006	---	288(14)	404(2)	460(20)	---	513(1)	511(2)	---	526(2)	685(2)

Table 6. Stocking history including size and number for fishes stocked into Eureka Lake, 2001-2014. WAE= walleye

Year	Species	Size	Number
2005	WAE	large fingerling	8,800
2007	WAE	small fingerling	19,520
2009	WAE	small fingerling	18,000
2011	WAE	fry	100,000
2013	WAE	fry	100,000

Table 7. Year class distribution based on the expanded age/length summary for yellow perch sampled in gill nets from Eureka Lake, 2010 and 2014.

	Year Class							
Survey Year	2014	2013	2012	2011	2010	2009	2008	2007
2014	2	6	2	24	7	5	1	1
2010	---	---	---	---	1	40		33

[1] Surveyed on August 17-18 (2010) and September 16 (2014)

Table 8. Weighted mean TL (mm) at capture by gender for yellow perch captured in experimental gill nets (expanded sample size) from Eureka Lake, 2010 and 2014. Note: sampling was conducted on August 17-18, 2010 and September 16, 2014.

	Age							
Year	0	1	2	3	4	5	6	7
2014								
Male	108(1)	202(1)	227(1)	253(1)	255(1)	---	---	---
Female	100(1)	192(5)	266(1)	283(23)	285(6)	292(5)	305(1)	315(1)
Combined	104(2)	194(6)	247(2)	282(24)	281(7)	292(5)	305(1)	315(1)
2010								
Male	87(1)	146(17)	---	197(1)	---	---	---	---
Female	---	149(23)	---	227(32)	---	---	---	---
Combined	87(1)	148(40)	---	226(33)	---	---	---	---

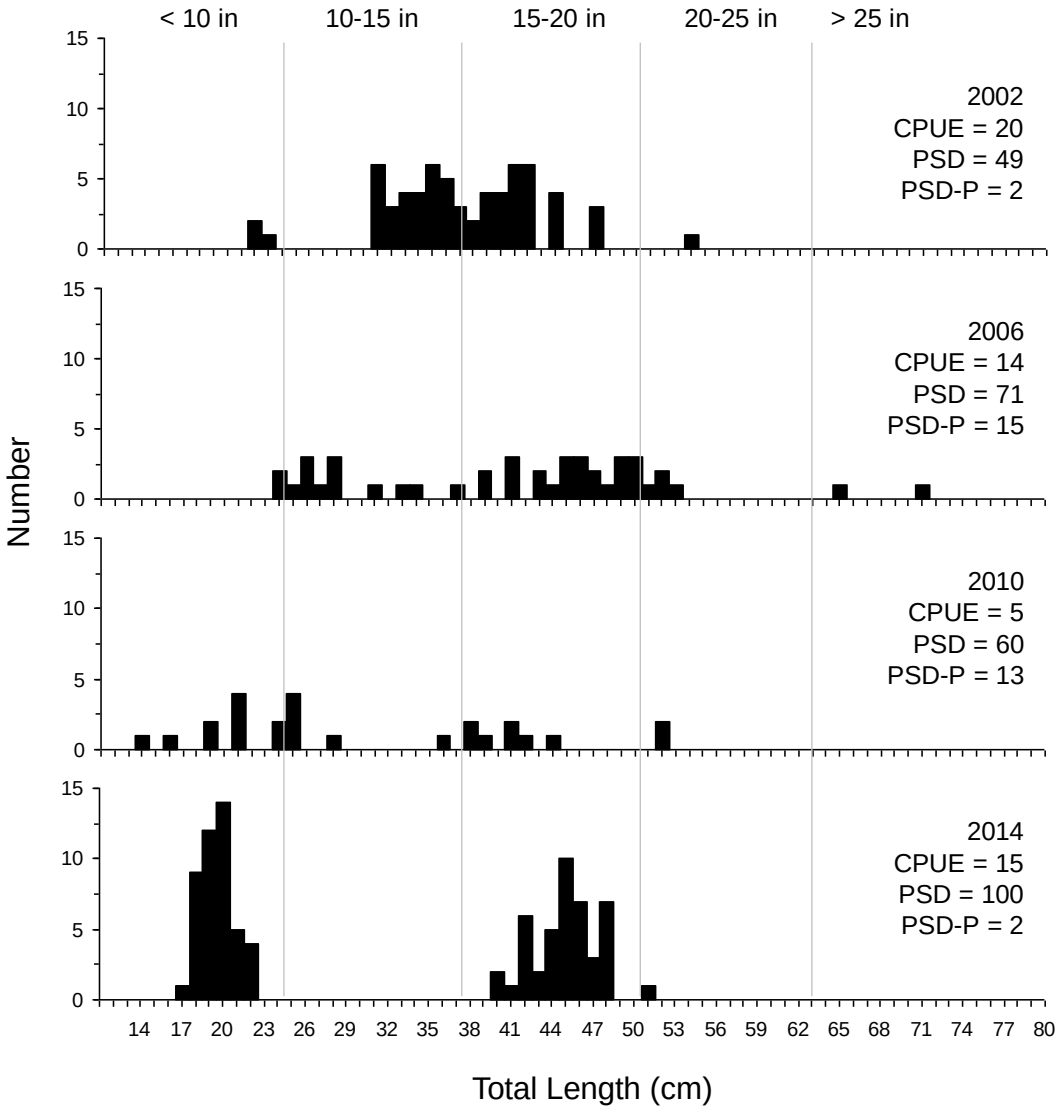
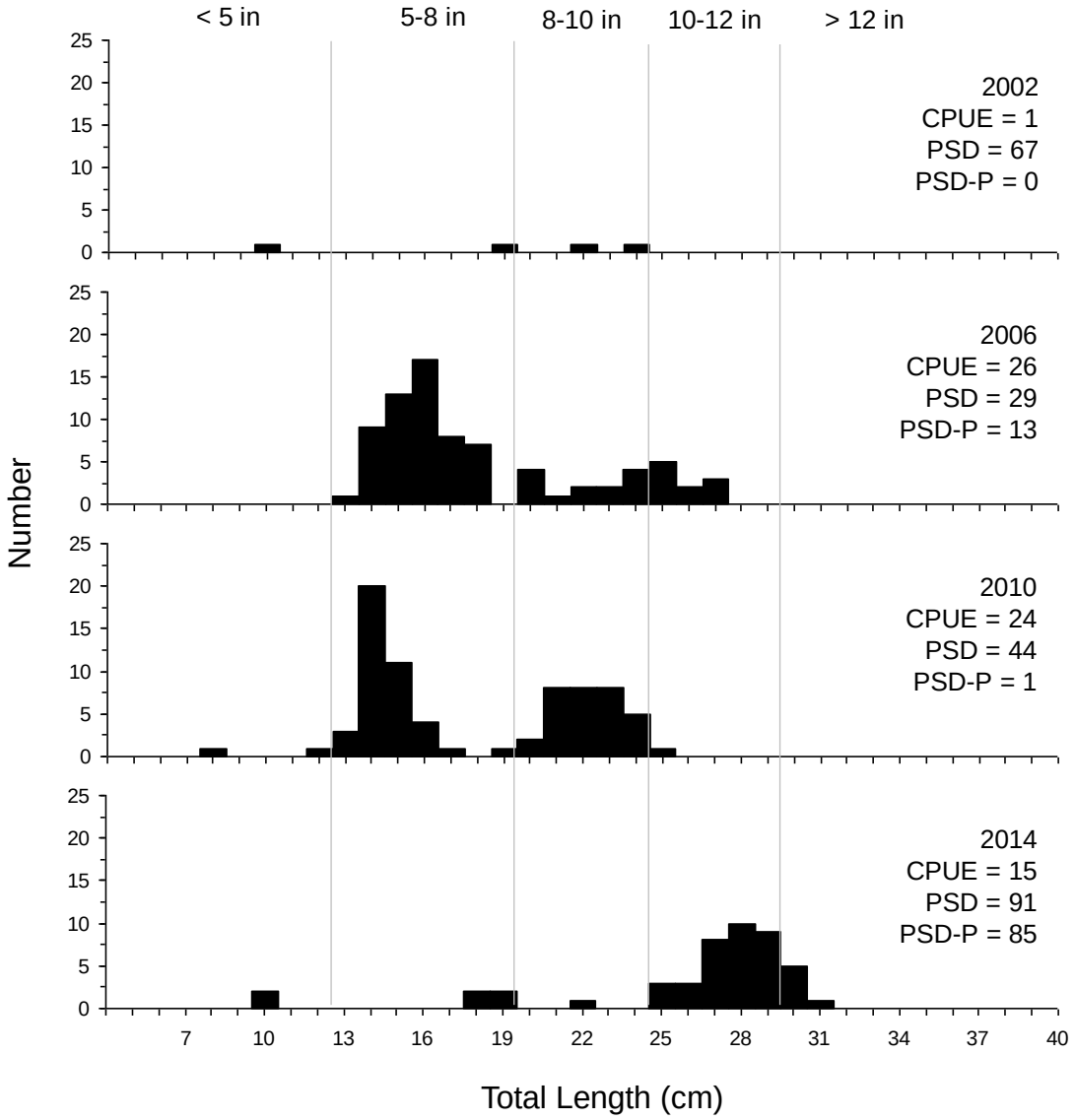


Figure 3. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for walleye captured using experimental gill nets in Eureka Lake, 2002-2010. Note sampling was conducted on June 4-5, 2002; September 19-20, 2010; August 17-18, 2010; and September 16, 2014.



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